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ABSTRACT

This guide outlines the topics of instruction and goals/objectives of a semester-long half-unit laboratory course in environmental technology (Agriscience 384) that is part of Texas' agricultural science and technology program. Presented first are lists of the following: essential elements common to all agricultural science and technology courses offered by Texas schools, essential elements specific to Agriscience 384, and the course's units and subtopics of instruction along with the suggested time allocated for each unit and the catalog numbers of Instructional Materials Service (IMS) curriculum materials that teachers may use to teach each topic/subtopic. The remainder of the guide lists the objectives to be met upon completion of each of the following course topics along with the corresponding IMS materials: the natural state of the environment; people, the environment, and the earth's natural resources; use and abuse of natural resources and their effects on the environment; environmental restoration and conservation; and resource accountability and environmental stewardship. (MN)

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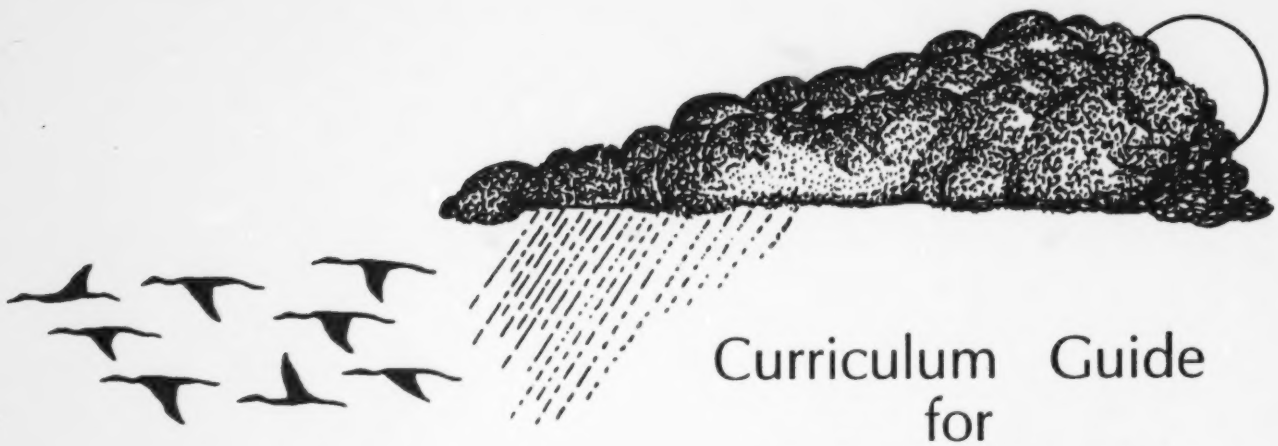

Curriculum Guide for Agriscience 384

ENVIRONMENTAL TECHNOLOGY

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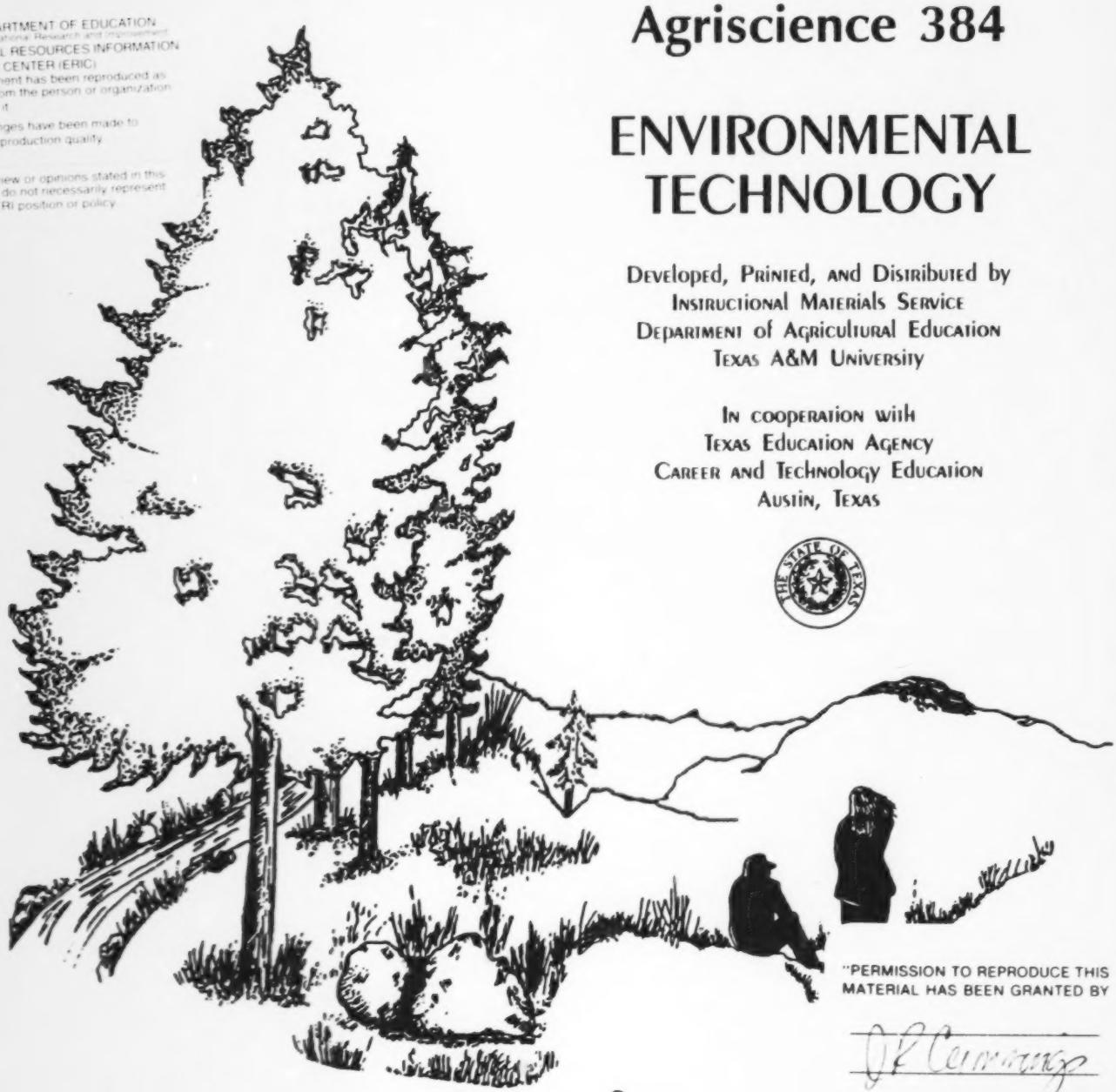

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CURRICULUM GUIDE
FOR
AGRISCIENCE 384

ENVIRONMENTAL TECHNOLOGY

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USING THE CURRICULUM GUIDE FOR AGRISCIENCE 384

Agriscience 384 - *Environmental Technology* - is one of various experimental semester courses in Agricultural Science and Technology. The course introduces students, in grades 10 - 12 in public secondary schools, to the field of environmental science. Students are exposed to basic skills in water quality management, air quality, natural resource management, conservation and remediation practices, environmental safety practices, and research through controlled classroom and field demonstrations and activities. Students enrolled in this course will have the opportunity to identify environmental values and form a set of ethics that should lead to the development of a personal environmental philosophy. Also included are units on agricultural career development, leadership activities, and record keeping.

While the primary purpose in the development of this curriculum guide is to assist the teacher in presenting the course, the guide may be used in other ways.

Pages 1 - 2 of this guide include lists of essential elements common to all career and technology courses. **Page 3** contains a list of essential elements specific to the Agriscience 384 course.

Pages 4 - 8 of this guide contain a list of units and subtopics of instruction with a suggested time (periods of instruction) allocated for each unit. In addition, each topic is referenced to the essential elements listed on pages 1 - 3. Listed also are catalog numbers of Instructional Materials Service (IMS) curriculum materials that may be used in teaching topics and satisfying essential element requirements. More than one suggested item of curriculum materials may be listed for effective instructional presentation of some topics. If all suggested curriculum materials listed are used, the essential element requirements of the course will be met.

Pages 9 - 20 of this guide provide the goals and objectives to be met upon completion of each unit. This section should be particularly useful to teachers in preparing lesson plans.

Each unit contains a list of references used in its development. If a more detailed presentation of subject matter is necessary, the teacher may acquire some of these references from IMS and/or the publishers cited in the reference section of each unit.

ESSENTIAL ELEMENTS

75.82 Agricultural Science and Technology

(a) The elements in this subsection are common to all agricultural science and technology courses, unless otherwise indicated, and shall be included in each course at the appropriate level. Every school offering agricultural science and technology shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or post secondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skill in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personal development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and functions of business management;

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills related to supervised agricultural activities. The student shall be provided opportunities to plan and conduct/perform supervised agricultural activities.

S_S75.82 Agricultural Science and Technology

Agriscience 384 - *Environmental Technology* (½ unit) - shall be a classroom/laboratory-oriented course that includes the essential elements and the concepts and skills related to environmental science. The student shall be provided opportunities to:

(1) describe the individual components that comprise the environment;

(2) discuss the interrelationship of biotic and abiotic components within an ecosystem;

(3) explore the sources and uses of renewable and non-renewable natural resources;

(4) identify the effects of responsible stewardship on the environment;

(5) identify the concepts and importance of responsible stewardship;

(6) analyze the impact of human population on the environment;

(7) explore several abuses of natural resources;

(8) identify the types and effects of pollution on the environment;

(9) explain the impact of habitat destruction on the environment;

(10) discuss environmental laws, legislation, and regulations;

(11) identify environmental conservation and preservation efforts;

(12) list selected restoration and conservation practices and discuss their implications;

(13) discuss and relate the three levels of environmental preservation and conservation efforts;

(14) discuss environmental ethics, responsibility, and education; and

(15) develop a personal environmental philosophy based on individual values and ethics.

Suggested activities and demonstrations are included with each unit. It is recommended that sixty percent of class instruction be set aside for these exercises. Actual time is left to the discretion of the teacher.

AGRISCIENCE 384
ENVIRONMENTAL TECHNOLOGY

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials
A. Natural State of the Environment	10		8447
1. Air	2	(1,2)	
a. Anatomy of the Atmosphere			
b. Composition			
c. Cycles of Atmospheric Gasses			
d. Functions			
2. Water	3	(1,2)	
a. Distribution			
b. Properties			
c. Composition			
d. Hydrological Cycle			
e. Functions			
3. Soil	2	(1,2)	
a. Components			
b. Formation			
c. Dynamics			
d. Properties			
e. Functions			
4. Living Organisms	3	(1,2)	
a. Nature of Ecology			
b. Types and Functions of Producers			
c. Types and Functions of Consumers			
d. Feeding Relationships			
5. Field and Classroom Activities and Demonstrations	*	(a)(4) (1,2)	
B. People, the Environment, and Earth's Natural Resources	10		8448
1. Natural Resources	2	(3)	
a. Definition			
b. Concepts			
c. Major Categories			
2. Renewable Natural Resources	3	(3)	
a. Definition			
b. Major Categories			

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials
3. Non-Renewable Natural Resources a. Definition b. Major Categories	3	(3)	
4. Relationship Between People, Natural Resources, and the Environment a. Obtaining Natural Resources b. Effects of Natural Resource Use c. Responsible Stewardship	2	(3,4,5)	
5. Field and Classroom Activities and Demonstrations	*	(a)(4) (3,4,5)	
C. Use and Abuse of Natural Resources	15		8449
1. Progression of Use Leading to Environmental Degradation a. Period of Pre-colonization b. Period of Abundance c. Period of Exploitation d. Period of Decline	2	(6,7,8)	
2. Human Population Dynamics a. Population History and Growth b. Population Profiles c. Population Demographics d. Environmental Impact	6	(6,9)	
3. Abuses of Natural Resources a. Accidental b. Incidental c. Deliberate	4	(6,7,8)	
4. Resulting Environmental Consequences a. Alteration of Natural Systems b. Reduction of Habitat c. Threatened and Endangered Species and Habitats	3	(6,7,8,9)	
5. Field and Classroom Activities and Demonstrations	*	(a)(4) (6,7,8,9)	

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials
D. Environmental Restoration and Conservation	17		8450
1. History a. Major Events b. Prominent People c. Prominent Organizations d. Major Results	3	(10,11)	
2. Research and Education a. Types of Research Activities b. Processes in Research c. Education's Interrelationship with Research d. Impacts of Research	2	(11)	
3. Legislation a. Major Environmental Legislation b. Federal Agency's Role in Environmental Concerns c. State Agency's Role in Environmental Concerns	3	(10,11)	
4. Restoration a. Importance b. Levels c. Results d. Economics	3	(11,12)	
5. Resource Conservation a. Importance b. Levels c. Results d. Economics	3	(11,12)	
6. Preservation a. Importance b. Examples c. Results d. Economics	3	(11,12)	
7. Field and Classroom Activities and Demonstrations	*	(a)(4) (10,11,12)	

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials
E. Resource Accountability and Environmental Stewardship	14		8451
1. Responsible Stewardship a. Concepts b. Importance c. Environmental Accountability d. Effects and Implications	5	(4,5,14)	
2. Environmental Preservation and Conservation Efforts a. Individual Efforts b. Societal Efforts c. Global Efforts d. Working Together	4	(13,14)	
3. An Individual Environmental Perspective a. Values b. Ethics c. Philosophy	5	(14,15)	
4. Field and Classroom Activities and Demonstrations	*	(a)(4) (4,5,13,14,15)	
F. Explore Career Opportunities in Environmental Technology	2		1050,2902 9025,9029
1. Recognize Careers in Environmental Technology	1	(a)(2)(A-L) (a)(3)(A-D)	
2. Evaluate Careers in Environmental Technology	1	(a)(2)(A-L)	
G. Plan and Conduct Leadership Activities Related to Environmental Technology	4		4850-4862 8003-8004a
1. Develop Leadership Skills Related to Environmental Technology	2	(a)(1)(A-D) (a)(5)(A-F)	
2. Participate in Leadership Activities Related to Environmental Technology	2	(a)(1)(A-D) (a)(5)(A-F)	

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials
H. Conduct Supervised Agricultural Experience Program and Activities Related to Environmental Technology	8		8001-8002d 8502,SAEP-J 384-S,384-A
1. Maintain Records Necessary to a Pre-Employment Laboratory Program in Environmental Technology	4	(a)(6)(A-I) (a)(7)	
2. Evaluate and Analyze Environmental Technology Records	4	(a)(7)	

GOALS

AND

OBJECTIVES

FOR

UNITS

IN

AGRISCIENCE 384

UNIT A
NATURAL STATE OF THE ENVIRONMENT

Section A-1: Air

Areas of Discussion:

a. Anatomy of the Atmosphere
b. Composition
c. Cycles of Atmospheric Gasses
d. Functions

Section Goal:

The student shall be provided the opportunity to identify the components of the earth's atmosphere and relate those components to the requirements for life.

Section Objectives:

After completing the section, the student shall be able to:

1. describe the composition of the atmosphere;
2. list the eight most abundant gases by percent volume which make up the composition of clean, dry air;
3. discuss how water vapor varies within the atmosphere;
4. list the three major cycles of atmospheric gasses;
5. explain the relationships which exist within the cycles of atmospheric gasses;
6. describe the dependence of organisms on the atmosphere; and
7. specify the importance and impact of water vapor in air.

Section A-2: Water

Areas of Discussion:

a. Distribution
b. Properties
c. Composition
d. Hydrological Cycle
e. Functions

Section Goal:

The student shall be provided the opportunity to outline the movement and distribution of water and discuss its importance in the environment.

Section Objectives:

After completing the section, the student shall be able to:

1. list the areas of distribution of the earth's water;
2. list the properties of water;
3. distinguish between suspensions and solutions;
4. illustrate the covalent bond between the hydrogen and oxygen atoms in a water molecule;
5. describe the three physical states of water;
6. define evaporation, humidity, and condensation;
7. illustrate the hydrological cycle and describe the processes of the cycle; and
8. discuss the functions of water in the environment.

Section A-3: Soil

Areas of Discussion:

a. Components
b. Formation
c. Dynamics
d. Properties
e. Functions

Section Goal:

The student shall be provided the opportunity to describe the processes involved in the formation of soils and the importance of soil to the environment.

Section Objectives:

After completing the section, the student shall be able to:

1. explain the dynamics of soil behavior;
2. list several independent variables which contribute to soil development;
3. illustrate the rock cycle;
4. explain how weathering contributes to soil formation;
5. list six stages of soil formation;
6. describe the four components of soil;
7. describe the properties associated with sandy, silty, clayey, and loamy soils;
8. interpret the soil textural triangle;
9. identify the physical properties of soil; and
10. discuss the functions of soil.

Section A-4: Living Organisms

Areas of Discussion:

a. Nature of Ecology
b. Types and Functions of Producers
c. Types and Functions of Consumers
d. Feeding Relationships

Section Goal:

The student shall be provided the opportunity to explain the relationships which exist between plants and animals within ecosystems.

Section Objectives:

After completing the section, the student shall be able to:

1. classify the major categories of organisms;
2. list the seven biomes of the North American Continent;
3. compare and contrast the different types of ecosystems;
4. explain the dynamic nature of ecosystems;
5. identify the functions of producers and consumers;
6. describe how biotic and abiotic factors affect producers and consumers;
7. compare the growth and development of various types of plant forms;
8. categorize the various forms of animal life;
9. describe the interactions between producers, consumers, and decomposers; and
10. illustrate a food chain and food web.

UNIT B
PEOPLE, THE ENVIRONMENT, AND EARTH'S NATURAL RESOURCES

Section B-1: Natural Resources

Areas of Discussion:

a. Definition
b. Concepts
c. Major Categories

Section Goal:

The student shall be provided the opportunity to examine the character and value of natural resources.

Section Objectives:

After completing the section, the student shall be able to:

1. discuss the value of natural resources;
2. list and describe the major categories of natural resources;
3. discuss the types and distributions of natural resources;
4. contrast the origins of natural resources;
5. describe the two types of natural resources; and
6. provide examples of renewable and non-renewable natural resources.

Section B-2: Renewable Natural Resources

Areas of Discussion:

a. Definition
b. Major Categories

Section Goal:

The student shall be provided the opportunity to explore the major categories of renewable natural resources.

Section Objectives:

After completing the section, the student shall be able to:

1. provide a comprehensive definition for renewable natural resources;
2. list and define the five major categories of renewable natural resources;
3. identify the origins of the five major categories of renewable natural resources; and
4. discuss the value of the five major categories of renewable natural resources.

Section B-3: Non-renewable Natural Resources

Areas of Discussion:

a. Definitions
b. Major Categories

Section Goal:

The student shall be provided the opportunity to explore the major categories of non-renewable natural resources.

Section Objectives:

After completing the section, the student shall be able to:

1. provide a comprehensive definition for non-renewable natural resources;
2. list and define the four major categories of non-renewable natural resources;
3. identify the origins of the four major categories of non-renewable natural resources; and
4. discuss the value of the four major categories of non-renewable natural resources.

Section B-4: Relationship Between People, Natural Resources, and the Environment

Areas of Discussion:

a. Obtaining Natural Resources
b. Effects of Natural Resource Use
c. Responsible Stewardship

Section Goal:

The student shall be provided the opportunity to evaluate the relationship between humans and natural resources and explain the benefits of responsible stewardship.

Section Objectives:

After completing the section, the student shall be able to:

1. describe the various methods used to obtain natural resources;
2. discuss the effects of obtaining natural resources on the environment; and
3. identify the effect of responsible stewardship on the environment.

UNIT C
USE AND ABUSE OF NATURAL RESOURCES AND THE EFFECTS ON THE ENVIRONMENT

Section C-1: Progression of Use Leading to Environmental Degradation

Areas of Discussion:

a. Period of Pre-colonization
b. Period of Abundance
c. Period of Exploitation
d. Period of Decline

Section Goal:

The student shall be provided the opportunity to evaluate the processes and events that have led to the exploitation of natural resources.

Section Objectives:

After completing the section, the student shall be able to:

1. describe the natural events which alter the environment;
2. explain why Native Americans had little impact on the environment;
3. identify the natural resources of North America that contributed to its colonization;
4. discuss the primary factor for the exploitation of natural resources;
5. identify the technological advances contributing to the exploitation of natural resources by industry;
6. identify the technological advances contributing to the exploitation of natural resources by agriculture;
7. identify the transportation advances contributing to the exploitation of natural resources; and
8. identify the results of overuse that occurred from the period of exploitation.

Section C-2: Human Population Dynamics

Areas of Discussion:

a. Population History and Growth
b. Population Profiles
c Population Demographics
d. Environmental Impact

Section Goal:

The student shall be provided the opportunity to explore the impact of an increasing human population and suggest the implications of future growth on the environment.

Section Objectives:

After completing the section, the student shall be able to:

1. discuss the history and growth of the human population during the past four thousand years;
2. define the following terms as applied to human population: doubling time, natural increase, natural decrease, rate of population change, and zero population growth;
3. interpret a population profile;
4. compare the population profile of a developing country to one of a developed country;
5. identify those countries with the highest and lowest fertility rates;
6. discuss the relationship between a country's economic status and its population; and
7. identify the results of increases in the population on the environment.

Section C-3: Abuses of Natural Resources

Areas of Discussion:

a. Accidental
b. Incidental
c. Deliberate

Section Goal:

The student shall be provided the opportunity to compare and contrast the incidences of abuse.

Section Objectives:

After completing the section, the student shall be able to:

1. explain the circumstances contributing to accidental abuse;
2. cite examples of accidental abuse;
3. explain the circumstances contributing to incidental abuse;
4. cite examples of incidental abuse;
5. explain the circumstances contributing to deliberate abuse; and
6. cite examples of deliberate abuse.

Section C-4: Resulting Environmental Consequences

Areas of Discussion:

a. Alteration of Natural Systems
b. Reduction of Habitat
c. Impact on Threatened and Endangered Species and Habitats

Section Goal:

The student shall be provided the opportunity to explain the consequences of resource use and abuse on the environment.

Section Objectives:

After completing the section, the student shall be able to:

1. identify specific consequences of resource use on air quality;
2. identify specific consequences of resource use on water quality;
3. identify specific consequences of resource use on soil productivity;
4. define habitat and discuss its importance to natural systems;
5. identify several causes for the reduction of habitat;
6. distinguish among the various types of habitat;
7. discuss why preservation of habitat is essential;
8. define the following terms: threatened, endangered, and extinct as applied to both plant and animal species;
9. list examples of threatened, endangered, and extinct plant and animal species; and
10. cite causes for the decrease of both plant and animal species.

UNIT D
ENVIRONMENTAL RESTORATION AND CONSERVATION

Section D-1: History

Areas of Discussion:

a. Prominent People
b. Prominent Organizations
c. Major Events
d. Major Results

Section Goal:

The student shall be provided the opportunity to identify the impacts of individuals and organizations on the development of environmental policies and issues.

Section Objectives:

After completing the section, the student shall be able to:

1. list prominent individuals involved with environmental issues;
2. discuss the role of President Theodore Roosevelt in early conservation and restoration efforts;
3. list prominent organizations involved with environmental issues;
4. identify the major issues addressed by selected environmental organizations;
5. match the major events in restoration and/or conservation activities to the organization(s) responsible;
6. match the major events in restoration and/or conservation activities to the individual(s) responsible; and
7. evaluate results of environmental restoration and conservation efforts.

Section D-2: Research and Education

Areas of Discussion:

a. Types of Research Activities
b. Processes in Research
c. Education's Interrelationship with Research
d. Impacts of Research

Section Goal:

The student shall be provided the opportunity to evaluate the effects of research and education on environmental issues.

Section Objectives:

After completing the section, the student shall be able to:

1. identify the methods of research used by both public and private agencies in restoration and conservation efforts;
2. identify the process used in restoration and conservation research;
3. explain the interrelationship between research and education; and
4. evaluate the outcome of environmental research projects.

Section D-3: Legislation

Areas of Discussion:

a. Major Environmental Legislation
b. Federal Agencies' Role in Environmental Concerns
c. State Agencies' Role in Environmental Concerns

Section Goal:

The student shall be provided the opportunity to discuss the role of government in environmental restoration and conservation.

Section Objectives:

After completing the section, the student shall be able to:

1. discuss the effects selected legislation has had on the environment;
2. identify federal agencies and their role in restoration and conservation; and
3. identify state agencies and their role in restoration and conservation.

Section D-4: Restoration

Areas of Discussion:

a. Importance
b. Levels
c. Results
d. Economics

Section Goal:

The student shall be provided the opportunity to explore the impact and implications of environmental restoration.

Section Objectives:

After completing the section, the student shall be able to:

1. explain the importance of environmental restoration;
2. cite examples of the various levels of environmental restoration;
3. identify the results of restoration efforts;
4. discuss economic issues of restoration project; and
5. identify non-economic benefits of restoration activities.

Section D-5: Resource Conservation

Areas of Discussion:

a. Importance
b. Levels
c. Results
d. Economics

Section Goal:

The student shall be provided the opportunity to explore the impact and implications of resource conservation.

Section Objectives:

After completing the section, the student shall be able to:

1. explain the importance of resource conservation;
2. cite examples of the various levels of resource conservation;
3. identify the results of conservation efforts;
4. discuss economic issues of conservation efforts; and
5. identify non-economic benefits of conservation activities.

Section D-6: Preservation

Areas of Discussion:

a. Importance
b. Examples
c. Results
d. Economics

Section Goal:

The student shall be provided the opportunity to explore the impact and implications of environmental preservation.

Section Objectives:

After completing the section, the student shall be able to:

1. explain the importance of environmental preservation;
2. cite examples of environmental preservation;
3. identify the results of preservation efforts;
4. discuss economic issues of preservation efforts; and
5. identify non-economic benefits of preservation activities.

UNIT E
RESOURCE ACCOUNTABILITY & ENVIRONMENTAL STEWARDSHIP

Section E-1: Responsible Stewardship

Areas of Discussion:

a. Concept
b. Importance
c. Environmental Accountability
d. Effects and Implications

Section Goal:

The student shall be provided the opportunity to identify the role of responsible stewardship in maintaining a healthy environment.

Section Objectives:

After completing the section, the student shall be able to:

1. define responsible stewardship;
2. explain the need for responsible stewardship on the environment;
3. discuss the need for environmental accountability;
4. identify the types of environmental accountability and cite one example of each; and
5. cite results stemming from responsible stewardship.

Section E-2: Environmental Preservation

Areas of Discussion:

a. Individual Efforts
b. Societal Efforts
c. Global Efforts
d. Working Together

Section Goal:

The student shall be provided the opportunity to explore the relationship among individual, societal, and global efforts of environmental preservation.

Section Objectives:

After completing the section, the student shall be able to:

1. identify the areas of individual efforts;
2. list eight individual efforts that promote environmental preservation;
3. identify the areas of societal efforts;
4. list four societal efforts that promote environmental preservation;
5. list four global actions that promote environmental concerns; and
6. discuss ways governmental agencies assist and coordinate environmental actions with individuals.

Section E-3: Individual Environmental Perspective

Areas of Discussion:

a. Values
b. Ethics
c. Philosophy

Section Goal:

The student shall be provided the opportunity to organize a personal set of environmental values and ethics, and develop an environmental philosophy.

Section Objectives:

After completing the section, the student shall be able to:

1. define values, ethics, and philosophy;
2. relate values, ethics, and philosophy to environmental concerns;
3. differentiate between a rights-based philosophy and a utilitarian philosophy;
4. cite an example of a rights-based philosophy as it relates to environmental concerns;
5. cite an example of a utilitarian philosophy as it relates to environmental concerns;
6. identify the factors that influence the development of individual values and ethics;
7. discuss the importance of having a personal environmental philosophy;
8. list examples of personal environmental values and ethics; and
9. identify an individual environmental philosophy.

- NOTES -

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